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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/539,387	06/15/2005	Frans Andreas Gerritsen	NL 021329	4691

24737 7590 12/23/2008
PHILIPS INTELLECTUAL PROPERTY & STANDARDS
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EXAMINER	
BROOME, SAID A	

ART UNIT	PAPER NUMBER
2628	

MAIL DATE	DELIVERY MODE
12/23/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/539,387	GERRITSEN ET AL.	
	Examiner	Art Unit	
	SAID BROOME	2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 13 is rejected under 35 U.S.C. 101 because the claim is directed towards a computer program product for causing a processor to process a data set, in which the computer program product that controls the processor is disclosed to be a program, as recited in the applicant's Specification on pg. 3 lines 2-5 and on pg. 12 lines 1-3, which is non-statutory subject matter. Similarly, computer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical "things." They are neither computer components nor statutory processes, as they are not "acts" being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer which permit the computer program's functionality to be realized. In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035. Accordingly, it is important to distinguish claims that define descriptive material per se from claims that define statutory inventions.

Claim 14 is rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. While the claims recite a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a

particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. The instant claims neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Argiro et al. (hereinafter "Argiro", U.S. Patent 5,986,662) in view of Kaufman et al. (hereinafter "Kaufman", US 2004/0125103).

Regarding claim 1, Argiro teaches a system for visualizing a three-dimensional (hereinafter "3D") volume, in particular for medical applications (col. 6 lines 19-28: "*The Advanced Diagnostic Viewer (ADV) is a three-dimensional medical imaging workstation, comprised of software running on general-purpose, high-performance three-dimensional graphics hardware. The invention provides both a two-dimensional and a three-dimensional environment in which to view voluminous data organized into a plurality of voxels, each voxel having at least a voxel value. One particular embodiment of the invention provides a diagnostic environment for medical professionals such as radiologists.*" *and is illustrated in Fig. 1: 100*); the system including:

an input for receiving a three-dimensional set of data representing voxel values of the 3D volume (col. 4 lines 9-11: "*The retrieve data set component permits a user to load a previously acquired set of voxel data.*");

a storage for storing the data set (col. 30 lines 63-64: "*...the set of voxel data from a storage device...*");

an output for providing pixel values of a two-dimensional (hereinafter "2D") image for rendering (col. 3 lines 10-11: "*...to produce image pixels for display on a computer screen.*"); and

a processor for, under control of a computer program, processing the data set to obtain a 2-dimensional representation of the volume (col. 6 lines 19-28: "*The Advanced Diagnostic Viewer (ADV) is a three-dimensional medical imaging workstation, comprised of software running on general-purpose, high-performance three-dimensional graphics hardware. The invention provides both a two-dimensional and a three-dimensional environment in which to view voluminous data organized into a plurality of voxels, each voxel having at least a voxel value*", *in which the software, or computer program product, causes the general-purpose graphic hardware to display three-dimensional data on a workstation, in which the hardware thereby comprises a processor to implement this display process*) by projecting the volume onto an imaginary 2D projection screen from a predetermined viewpoint by for each pixel of the 2D projection image (col. 4 lines 17-34: "*The image gallery component displays these initial volume-rendered images of the data...the user in more particular is able to refine the view or views of the selected image. The examination viewer component provides the user with exacting controls in the viewing of the image...The examination viewer component also allows the user to*

fly around and through the data, to obtain the correct view sought. The user is able to select a number of snapshots of such views, or create a video recording of the views. The report generator/viewer component permits the user to assemble these views..." and col. 14 lines 25-32: "*...viewer component 114 permits display of an image of a patient's data with selected settings by volume view and multiplanar reformatting (MPR) orthogonal or oblique views; by inside view, outside view, and MPR orthogonal or oblique views; and, by volume view only, which is a large three-dimensional rendering. That is, examination viewer component 114 displays different and modifiable views of a selected image data.*"):

casting a ray through the pixel and through the volume (col. 3 lines 1-4: "*...ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel.*");

traversing along the ray through at least a plurality of ray positions within the volume under control of a protocol that determines a rendering algorithm and/or rendering parameters in dependence on the ray position (col. 2 line 63 - col. 2 line 8: "*In one method of voxel rendering, called image ordering or ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel. As each ray penetrates the volume, it accumulates the properties of the voxels it passes through and adds them to the corresponding pixel. The properties accumulate more quickly or more slowly depending on the transparency of the voxels.*" and col. 4 lines 11-16: "*...a protocol that includes preset adjustments for the volume-rendering of the data, based on the type of data that was loaded via the retrieve data set component. This protocol allows for an initial volume-rendering of the data that is logical in light of the type of data.*", *in which a ray is cast through*

portions of volume data with respect to the volume rendering protocol which renders the volume using corresponding penetrated positions of the ray as it traverses the volume); and

However, Argiro fails to teach casting a ray from the viewpoint, for each of the plurality of ray positions using the determined rendering algorithm/parameters to calculate a contribution to a pixel value of the pixel based on at least one voxel value within a predetermined range of the ray position. Kaufman teaches casting a ray from the viewpoint (¶0253 lines 7-8: "*…rays 174 are cast from the viewpoint 172…*"), for each of the plurality of ray positions using the determined rendering algorithm/parameters to calculate a contribution to a pixel value of the pixel based on at least one voxel value within a predetermined range of the ray position (¶0008 lines 3-14: "*Volume rendering is one of the most common techniques for visualizing the 3D scalar field of a continuous object or phenomenon represented by voxels at the grid points of the volume dataset…rays are cast from screen pixels through the volume dataset, and contributions of voxels along these sight rays are used to evaluate the corresponding pixel values.*" and ¶0021 lines 1-12: "*…the present invention is a method and apparatus for performing approximate perspective volumetric ray casting of a three-dimensional (3D) volume dataset…The length of the volume dataset is calculated between the location of the nearest voxel to the viewpoint and the farthest voxel from the viewpoint.*", *in which rays are cast through a volume to produce a contributing pixel value within the entire volume dataset by penetrating the range and length of the dataset*), therefore it would have been obvious to one skilled in the art at the time of invention to modify the volume rendering of Argiro with the calculated contributing pixel values of Kaufman because this modification ensures correct display of a volume data set through providing a rendering algorithm enabling the contributing pixel value of each corresponding ray

to be calculated as it traverses through a range of the data set to provide accurate representation of the volume on a display screen.

Regarding claim 2, Argiro teaches the protocol is based on a-priori knowledge of the clinical situation (col. 10 lines 43-45: "*...the protocols are generated a priori by clinical testing to determine the most appropriate presets for a particular data set.*").

Regarding claim 3, Argiro teaches the a-priori knowledge is derived from a 3D model of at least one object in the volume (col. 10 lines 43-53: "*...the protocols are generated a priori by clinical testing to determine the most appropriate presets for a particular data set. Protocols span the presets for the viewing of the images within a data set, and in one embodiment also span the presets for performing a specific test to obtain data...Protocols thus include presets for the visual controls governing the viewing of the volume-rendering of the voxel data...*").

Regarding claim 4, Argiro teaches the protocol is rule-based (col. lines 42-53: "*A protocol is defined as a group of preset settings...The settings and the protocols are generated a priori by clinical testing to determine the most appropriate presets for a particular data set. Protocols span the presets for the viewing of the images within a data set, and in one embodiment also span the presets for performing a specific test to obtain data (i.e., acquisition parameters...Protocols thus include presets for the visual controls governing the viewing of the volume-rendering of the voxel data...*", *in which the protocol is based on specific settings or rules that govern the implementation of the protocol*).

Regarding claim 5, Argiro teaches a rule prescribes for each of the plurality of ray positions at least one processing action at least in dependence on processing results of ray position along the ray that already been processed (col. 3 lines 1-8: "*...ray casting, the volume is*

positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel. As each ray penetrates the volume, it accumulates the properties of the voxels it passes through...The properties accumulate more quickly or more slowly depending on the transparency of the voxels.", *in which a ray processes results of the ray at positions that have already been processed using an accumulation processing action of the volume rendering protocol*).

Regarding claim 6, Argiro teaches the processing action includes jumping forward along a ray to a particular ray position, and resuming processing form that position (col. 3 lines 1-8: "*...a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel. As each ray penetrates the volume, it accumulates the properties of the voxels it passes through...*", *where the ray continually jumps forward in an accumulation processing action as it penetrates at the position of each voxel of the volume along the ray to produce the accumulated data*).

Regarding claim 7, Argiro teaches a storage of the system includes a plurality of protocols for controlling the traversing along the ray (col. 11 lines 7-17: "*...there are 1-N protocols 186, where N is the number of protocols 186...The external configuration file specifies which protocol selector fields are to be matched with which protocol names.*", col. 10 lines 51-53: "*Protocols thus include presets for the visual controls governing the viewing of the volume-rendering of the voxel data...*" and in col. 3 lines 1-4: "*...volume rendering is the use of the entire voxel data set to create an image. In one method of voxel rendering, called...ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from*

each pixel in the picture plane through the volume behind the pixel.", *where a plurality of protocols are stored, such as the volume rendering protocol for implementing ray traversal*).

Regarding claim 8, Argiro teaches storage includes respective predetermined protocols for a plurality of distinct types of volumes (col. 11 lines 7-17: "*...there are 1-N protocols 186, where N is the number of protocols 186...The external configuration file specifies which protocol selector fields are to be matched with which protocol names.*" and col. 4 lines 11-16: "*...a protocol that includes preset adjustments for the volume-rendering of the data, based on the type of data that was loaded via the retrieve data set component. This protocol allows for an initial volume-rendering of the data that is logical in light of the type of data.*", *in which the protocol file includes a plurality of protocols, which are preset or pre-designated for a related type of data*).

Regarding claim 9, Argiro teaches storage includes for at least one type of volume a plurality of predetermined protocols (col. 11 lines 7-17: "*...there are 1-N protocols 186, where N is the number of protocols 186...The external configuration file specifies which protocol selector fields are to be matched with which protocol names.*" and col. 4 lines 11-16: "*...a protocol that includes preset adjustments for the volume-rendering of the data, based on the type of data that was loaded via the retrieve data set component. This protocol allows for an initial volume-rendering of the data that is logical in light of the type of data.*", *in which the protocol file includes a plurality of protocols, which are preset or pre-designated for a related type of data, in which the protocol file includes a plurality of preset or pre-designated protocols for at least one type of corresponding data*).

Regarding claim 10, Argiro teaches the computer program is operative to cause the processor to enable a human operator to select at least one protocol from the plurality of stored protocols for processing the volume (col. 11 lines 7-17: "*…there are 1-N protocols 186, where N is the number of protocols 186…*"and col. 4 lines 17-20: "*The image gallery component displays these initial volume-rendered images of the data, and permits the user to select a different protocol in accordance with which to render the images.*", *in which the image gallery components of the system, as shown in Fig. 2: 112, enables the user to select the protocol from a plurality of protocols stored in a file, in which the system would consequently contain a processing unit to implement the software to of the image gallery unit to enable user selection of the protocols*).

Regarding claim 11, Argiro teaches the computer program is operative to cause the processor to store a selection of a human operator in association with an identity of the operator for subsequent retrieval (col. 12 lines 41-55: "*…current protocol 212 initially shows the pre-selected protocol…A user, such as a radiologist or a technician, changes the pre-selected protocol by selecting one of the alternatives 214, which then becomes protocol 212.*", *in which the protocol component of the system, as shown in Fig. 2: 110, enables subsequent user change of pre-selected protocols to a new protocol, in which each of the protocols are retrieved from a plurality of protocols stored in a file,* col. 11 lines 7-17: "*…there are 1-N protocols 186, where N is the number of protocols 186…The external configuration file specifies which protocol selector fields are to be matched with which protocol names.*", *where the system would consequently contain a processing unit to implement the software to of the protocol component to enable subsequent retrieval of user selection and modification to the protocols*).

Regarding claim 12, Argiro teaches the computer program is operative to cause the processor to enable a human operator to adapt a protocol for processing the volume (col. 12 lines 41-55: "*...current protocol 212 initially shows the pre-selected protocol...A user, such as a radiologist or a technician, changes the pre-selected protocol by selecting one of the alternatives 214, which then becomes protocol 212.*" and col. 4 lines 11-16: "*...a protocol that includes preset adjustments for the volume-rendering of the data, based on the type of data that was loaded...This protocol allows for an initial volume-rendering of the data that is logical in light of the type of data.*", *in which the protocol component of the system, as shown in Fig. 2: 110, enables the user to change the protocol, such as to a volume protocol, in which the system would thereby contain a processing unit to implement the software to of the protocol component to enable user selection and modification to the protocols*).

Regarding claim 13, Argiro teaches a computer program product for causing a processor to process a three-dimensional set of data representing voxel values of a 3D volume (col. 6 lines 19-28: "*The Advanced Diagnostic Viewer (ADV) is a three-dimensional medical imaging workstation, comprised of software running on general-purpose, high-performance three-dimensional graphics hardware. The invention provides both a two-dimensional and a three-dimensional environment in which to view voluminous data organized into a plurality of voxels, each voxel having at least a voxel value* ", *in which the software, or computer program product, causes the general-purpose graphic hardware to process three-dimensional data, in which the hardware thereby comprises a processor to implement this process*) to obtain a 2-dimensional representation of the volume by projecting the volume onto an imaginary 2D projection screen from a predetermined viewpoint by for each pixel of the 2D projection image (col. 4 lines 17-34:

"*The image gallery component displays these initial volume-rendered images of the data...the user in more particular is able to refine the view or views of the selected image. The examination viewer component provides the user with exacting controls in the viewing of the image...The examination viewer component also allows the user to fly around and through the data, to obtain the correct view sought. The user is able to select a number of snapshots of such views, or create a video recording of the views. The report generator/viewer component permits the user to assemble these views...*" and col. 14 lines 25-32: "*...viewer component 114 permits display of an image of a patient's data with selected settings by volume view and...by inside view, outside view, and MPR orthogonal or oblique views; and, by volume view only, which is a large three-dimensional rendering.*", *where the volume data is projected onto a display to obtain a two-dimensional representation on a screen from a defined point of view*):

casting a ray through the pixel and through the volume (col. 3 lines 1-4: "*...ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel.*"); and

traversing along the ray through at least a plurality of ray positions within the volume under control of a protocol that determines a rendering algorithm and/or rendering parameters in dependence on the ray position (col. 2 line 63 - col. 2 line 8: "*In one method of voxel rendering, called image ordering or ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel. As each ray penetrates the volume, it accumulates the properties of the voxels it passes through and adds them to the corresponding pixel. The properties accumulate more quickly or more slowly depending on the transparency of the voxels.*" and col. 4 lines 11-16: "*...a protocol*

that includes preset adjustments for the volume-rendering of the data, based on the type of data that was loaded via the retrieve data set component. This protocol allows for an initial volume-rendering of the data that is logical in light of the type of data.", in which a ray is cast through portions of volume data with respect to the volume rendering protocol which renders the volume using corresponding penetrated positions of the ray as it traverses the volume);

However, Argiro fails to teach casting a ray from the viewpoint, and for each of the plurality of ray positions using the determined rendering algorithm to calculate a contribution to a pixel value of the pixel based on at least one voxel value within a predetermined range of the ray position. Kaufman teaches casting a ray from the viewpoint (¶0253 lines 7-8: "*...rays 174 are cast from the viewpoint 172...*"), and for each of the plurality of ray positions using the determined rendering algorithm to calculate a contribution to a pixel value of the pixel based on at least one voxel value within a predetermined range of the ray position (¶0008 lines 3-14: "*Volume rendering is one of the most common techniques for visualizing the 3D scalar field of a continuous object or phenomenon represented by voxels at the grid points of the volume dataset...rays are cast from screen pixels through the volume dataset, and contributions of voxels along these sight rays are used to evaluate the corresponding pixel values.*" and ¶0021 lines 1-12: "*...the present invention is a method and apparatus for performing approximate perspective volumetric ray casting of a three-dimensional (3D) volume dataset...The length of the volume dataset is calculated between the location of the nearest voxel to the viewpoint and the farthest voxel from the viewpoint.", in which rays are cast through a volume to produce a contributing pixel value within the entire volume dataset by penetrating the range and length of the dataset*), therefore it would have been obvious to one of ordinary skill in art at the time of

invention to modify the volume rendering of Argiro with the calculated contributing pixel values of Kaufman because this modification ensures correct display of a volume data set through providing a rendering algorithm that enables the contributing pixel value of each corresponding ray to be calculated as it traverses through an entire range of the data set to provide accurate representation of the range of the volume on a display screen.

Regarding claim 14, Argiro teaches a method of visualizing a 3D volume by processing a three-dimensional set of data representing voxel values of a 3D volume (col. 2 line 67 - col. 3 line 4: "*In one method of voxel rendering...or ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel.*") to obtain a 2-dimensional representation of the volume by projecting the volume onto an imaginary 2D projection screen from a predetermined viewpoint by for each pixel of the 2D projection image (col. 4 lines 17-34: "*The image gallery component displays these initial volume-rendered images of the data...the user in more particular is able to refine the view or views of the selected image. The examination viewer component provides the user with exacting controls in the viewing of the image...The examination viewer component also allows the user to fly around and through the data, to obtain the correct view sought. The user is able to select a number of snapshots of such views, or create a video recording of the views. The report generator/viewer component permits the user to assemble these views…*", *where the volume data is projected onto a display to obtain a two-dimensional representation on a screen from a defined point of view*):

casting a ray through the pixel and through the volume (col. 3 lines 1-4: "*…ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel.*"); and

traversing along the ray through at least a plurality of ray positions within the volume under control of a protocol that determines a rendering algorithm and/or rendering parameters in dependence on the ray position (col. 2 line 63 - col. 2 line 8: "*In one method of voxel rendering, called image ordering or ray casting, the volume is positioned behind the picture plane, and a ray is projected perpendicularly from each pixel in the picture plane through the volume behind the pixel. As each ray penetrates the volume, it accumulates the properties of the voxels it passes through and adds them to the corresponding pixel. The properties accumulate more quickly or more slowly depending on the transparency of the voxels.*" and col. 4 lines 11-16: "*…a protocol that includes preset adjustments for the volume-rendering of the data, based on the type of data that was loaded via the retrieve data set component. This protocol allows for an initial volume-rendering of the data that is logical in light of the type of data.*", *in which a ray is cast through portions of volume data with respect to the volume rendering protocol which renders the volume using corresponding penetrated positions of the ray as it traverses the volume*);

However, Argiro fails to teach casting a ray from the viewpoint, and for each of the plurality of ray positions using the determined rendering algorithm to calculate a contribution to a pixel value of the pixel based on at least one voxel value within a predetermined range of the ray position. Kaufman teaches casting a ray from the viewpoint (¶0253 lines 7-8: "*…rays 174 are cast from the viewpoint 172…*"), and for each of the plurality of ray positions using the determined rendering algorithm to calculate a contribution to a pixel value of the pixel based on

at least one voxel value within a predetermined range of the ray position (¶0008 lines 3-14: "*Volume rendering is one of the most common techniques for visualizing the 3D scalar field of a continuous object or phenomenon represented by voxels at the grid points of the volume dataset...rays are cast from screen pixels through the volume dataset, and contributions of voxels along these sight rays are used to evaluate the corresponding pixel values.*" and ¶0021 lines 1-12: "*...the present invention is a method and apparatus for performing approximate perspective volumetric ray casting of a three-dimensional (3D) volume dataset...The length of the volume dataset is calculated between the location of the nearest voxel to the viewpoint and the farthest voxel from the viewpoint.*", *in which rays are cast through a volume to produce a contributing pixel value within the entire volume dataset by penetrating the range and length of the dataset*), therefore it would have been obvious to one skilled in the art at the time of invention to modify the volume rendering of Argiro with the calculated contributing pixel values of Kaufman because this modification ensures correct display of a volume data set through providing a rendering algorithm that enables the contributing pixel value of each corresponding ray to be calculated as it traverses through an entire range of the data set to provide accurate representation of the range of the volume on a display screen.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The prior art patents and non-patent literature on the attached PTO-892 form pertain to three-dimensional volume visualization:

- Avila, R., He, T., Hong, L., Kaufman, A., Pfister, H., Silva, C., Sobierajski, L., Wang, S., VolVis: a diversified volume visualization system, Octoboer, 1994, Proceedings of the conference on Visualization '94, pp. 31-38.
- Okerlund et al. U.S. Patent 6,690,371
- Knittel et al. U.S. Patent 6,532,017
- Vining et al. U.S. Patent 7,149,564

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SAID BROOME whose telephone number is (571)272-2931. The examiner can normally be reached on M-F 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571)272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ulka Chauhan/
Supervisory Patent Examiner, Art Unit 2628

/Said Broome/
Examiner, Art Unit 2628